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CRUISE RESULTS

CRUISE 92-1 ALASKA
CRUISE 92-1 TRACY ANNE
CRUISE 92-1 MYS BABUSHKINA
1992 EASTERN BERING SEA CRAB AND GROUNDFISH SURVEY
JUNE-AUGUST 1992

The Resource Assessment and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC) conducted a crab and groundfish survey of the eastern Bering Sea from June to August 1992. This was a continuation of the annual series of eastern Bering Sea resource assessment surveys which began in 1971.

A cooperative bottom trawl survey was also conducted aboard the Russian Federation research vessel Mys Babushkina from the Pacific Research Institute of Fisheries and Oceanography (TINRO). The TINRO vessel sampled the Bering Sea continental shelf west of the U.S.-U.S.S.R. convention line.

OBJECTIVES

The primary objective of this survey was to provide distribution, abundance, and biological information on crab and groundfish resources in the Bering Sea for:

1. the North Pacific Fishery Management Council,
2. the U.S. fishing industry, and
3. scientific studies of the resources.



Secondary objectives were to:

1. retrieve bottom temperature sensors that were deployed in 1991 nearshore waters of Port Moller, Port Heiden, and Kvichak Bay;
2. conduct additional sampling near the Pribilof Islands and near St. Matthew Island in order to reduce variability in population estimates of king crab (Paralithodes sp.) and Tanner crab (Chionoecetes sp.);
3. assess yellowfin sole (Pleuronectes asper) size and age at maturity, as well as to determine the timing and location of spawning;
4. evaluate trawl performance and configuration with mensuration equipment;
5. delineate the distribution and relative abundance of the closely-related species of arrowtooth (Atherestes stomias) and Kamchatka (A. evermanni) flounder, flathead (Hippoglossoides elassodon) and Bering (H. robustus) sole, and great (Myoxcephalus polyacanthocephalus) and plain (M. jaok) sculpin;
6. collect stomach samples for food habit studies;
7. collect and preserve tissue and other biological samples from red king crab (P. camtschatica), blue king crab (P. platypus), Pacific herring (Clupea harengus pallasi), walleye pollock (Theragra chalcogramma), and Pacific cod (Gadus macrocephalus) for histopathology and parasitology studies; and
8. collect and preserve whole specimens and tissue samples for special studies requests.

VESSELS AND GEAR

Sampling in the eastern Bering Sea standard area was coordinated between the 30.5-m University of Washington research vessel Alaska and the 30.5-m commercial fishing vessel Tracy Anne. An independent trawl survey was conducted aboard the Russian Federation stern trawler Mys Babushkina over the western Bering Sea continental shelf.

The standard bottom trawl used by the U.S. vessels at all stations was an 83-112 eastern trawl (Figure 1). This net has a 25.3-m (83-ft) headrope and a 34.1-m (112-ft) footrope (Fig. 1). It is towed behind 1,000-kg, 1.8-m X 2.7-m steel V-doors and 54.9-m (180.1-ft) paired dandyline. Each lower dandyline had a 0.61-m chain extension connected to the lower wing to improve bottom tending characteristics. The 83-112 eastern trawl has been the standard sampling net used by U.S. vessels during annual eastern Bering Sea surveys since 1982, when it replaced the 400-mesh

eastern trawl. The Mys Babushkina used a 35/41 Soviet bottom trawl at all sampling sites. A complete description of this net was not available.

Net mensuration systems aboard the Alaska and Tracy Anne were used to provide gear configuration and performance data to be used in area-swept calculations. Such information was not available from the Mys Babushkina.

ITINERARY

The Alaska and Tracy Anne departed Dutch Harbor, Alaska, on June 3 and returned to Dutch Harbor on August 6, upon completion of the survey. Scientific personnel were exchanged on both vessels in Dutch Harbor on June 24 and July 17. A total of 10 vessel days were lost due to poor weather conditions. The Tracy Anne made unscheduled port calls on June 17 and 19 and July 2, 10, and 29 for fuel, water, supplies, and repairs, resulting in a total of 7 additional days in port. Eight days were spent in transit to and from fishing areas. Unscheduled port calls were made by the Alaska at Dutch Harbor on June 21 and at St. Paul on July 10. The Alaska lost a total of 5 fishing days due to a medical emergency and because of mechanical breakdowns. Six days were spent in transit.

The Mys Babushkina embarked U.S. scientists at Dutch Harbor on June 5 and proceeded to Cape Olyutorski to begin sampling operations. The Mys Babushkina returned to Dutch Harbor on July 29, after completing the western Bering Sea survey.

SURVEY DESIGN AND METHODS

The standard U.S. survey area sampled by the Alaska and Tracy Anne is shown in Figure 2. Sampling sites were established on the basis of a 20 x 20 nautical mile grid pattern used during previous surveys, with more intensive sampling conducted in the Pribilof Islands and St. Matthew Island regions to collect additional data on crab populations. Additional stations northwest of the standard survey area were sampled to estimate the abundance of Opilio Tanner crab (C. opilio) in an area that has produced high commercial landings in recent years. This additional information will be used to reduce the variability in the crab estimates.

The Alaska and Tracy Anne sampled alternate north/south columns of stations proceeding from Bristol Bay westward to the shelf edge. Thirty-minute tows were conducted at most sampling sites. All catches were sorted to the lowest possible taxon, weighed, and enumerated. Station data, including time, position, trawl performance, and tow distance, as well as catch information, were entered onto diskettes with shipboard dataloggers. Size composition, age samples, and other biological data were collected from the major fish species encountered. Length-width, shell

condition, and clutch size, as well as tissues and organs for various studies, were collected from the major crab species. Special study collections were stored in appropriate fixatives or frozen.

Seawater temperature profiles were collected at most stations using either a micro-bathythermograph (MBT) attached to the head rope of the net or expendable bathythermograph (XBT) probes released from the ship. Surface temperatures were also collected with a thermometer lowered over the side of the ship.

Trawl performance and net configuration data were recorded at most sampling sites using net mensuration systems aboard both vessels. These data were used in area-swept and catch-per-unit-effort (CPUE) calculations.

The Mys Babushkina sampled Bering Sea continental shelf waters west of the U.S.S.R. convention line, including the Gulf of Anadyr and west to Cape Olyutorski. Sampling methodology and design was similar to that used aboard the U.S. vessels.

RESULTS

The Alaska and Tracy Anne successfully completed 336 bottom hauls in the standard area, including 26 special-study tows to collect additional information on king and Tanner crab near the Pribilof Islands and near St. Matthew Island (Figure 2). Twenty tows were also completed north of the standard sampling area to assess C. opilio Tanner crab populations northwest of St. Matthew Island. Eighteen stations east and south of Nunivak Island were deleted from the standard area due to time lost to weather and mechanical and logistical problems. These stations were considered to be the least significant to the overall multispecies nature of the survey. Based on past surveys of the deleted stations, the species most affected were Alaska plaice (Pleuronectes quadrituberculatus), yellowfin sole, and rock sole. Estimates of the mean percentage of biomass found in this area for the species were 11%, 8%, and 6%, respectively.

The Mys Babushkina completed 124 bottom trawls. Catch and biological data were retained by the TINRO scientists on board the vessel and are not currently available. However, these data sets should be submitted to the AFSC for review and analysis in the near future.

Biological data collected from fish species aboard the Alaska and Tracy Anne are summarized in Table 1. Approximately 130,000 length measurements and 4,172 age structures were collected by sex-centimeter category from the major fish species. Stomachs were preserved from 8,021 fish from various fish taxa for feeding habit analysis. Numerous whole specimens of various species were preserved for identification, training, and other purposes. Blood smears and pathology and parasitology tissue samples were

collected from 219 fish, 166 crab, and 1 shrimp. Yellowfin sole maturity data were collected at 25 stations.

The total standard survey area encompassed approximately 135,100 nmi². Catch rates for the standard U.S. survey area averaged 305.9 kg per hectare of area trawled. Catch rates of commercially important fish and crab species taken by the Alaska and Tracy Anne are shown in Table 2.

Walleye pollock was the most abundant fish species encountered, with an overall CPUE of 97 kg/ha trawled. They were taken at nearly all sampling sites, with the largest mean catch (189 kg/ha) observed in outer shelf waters at depths of 100-200 m (Figure 3). The largest concentrations of pollock were located around the Pribilof Islands and northwest of the Pribilofs. Mean catches were greatly reduced at depths less than 50 m (19 kg/ha).

Yellowfin sole (Figure 4) and rock sole (Pleuronectes bilineatus, Figure 5) were the most abundant flatfish species, with overall mean CPUE values of 44 kg/ha and 32 kg/ha, respectively. Yellowfin sole were primarily restricted to inner (112 kg/ha) and central shelf (39 kg/ha) waters. Rock sole were abundant on the inner (79 kg/ha) and central shelf areas (28 kg/ha) and to a lesser degree on the outer shelf (4.3 kg/ha). The highest catch rates of rock sole ranged in an arc from inside Bristol Bay northwest to Nunivak Island and southwest to the Pribilof Islands.

Pacific cod were encountered at nearly all sites sampled (Figure 6). Catch rates did not appear to be correlated with depth; mean CPUE values were 12 kg/ha on the inner shelf, 10 kg/ha in the central shelf, and 13 kg/ha on the outer shelf. Highest concentrations were encountered along the Alaska Peninsula and northwest of the Pribilof Islands.

Flathead sole, Alaska plaice, arrowtooth flounder, and Pacific halibut (Hippoglossus stenolepis) were also relatively abundant. Flathead sole (13.7 kg/ha) were the most abundant species of this group, followed by Alaska plaice (10.8 kg/ha), arrowtooth flounder (7.9 kg/ha), and Pacific halibut (2.1 kg/ha).

Opilio Tanner crab was the most abundant commercially important crab species encountered, with a total average catch rate of 9.9 kg/ha. Bairdi Tanner crab, red king crab, and blue king crab were caught at mean rates of 3.2 kg/ha, 0.9 kg/ha, and 0.4 kg/ha, respectively, over the standard U.S. survey area.

Based on survey results alone, there appeared to be no major changes in 1992 from the long-term pattern for species distributions, abundance, or temperature regime.

SCIENTIFIC PERSONNEL^aAlaskaLeg 1

C. Armistead^b
 P. Goddard
 D. Bishop
 J. McClelland
 P. Cumisky^c
 J. Haaga^c

Leg 2

W. Flerx^b
 M. Zimmermann
 F. Morado
 D. Smith
 B. Stevens^c
 J. Orensanz^e

Leg 3

T. Sample^b
 D. Fisk
 S. Wilson
 K. Smith^c
 P. Anderson^c
 R. Kimball

Tracy AnneLeg 1

T. Sample^b
 D. Nichol
 D. Roetcisoender
 S. Wilson
 B. Dew^c
 A. Johnson^c

Leg 2

G. Walters^b
 P. Goddard
 A. Ward
 F. Hartsock^c
 K. Smith^c

Leg 3

D. Nichol^b
 L. Faughnan
 K. Craig
 E. Munk^c
 S. Payne^c

Mys BabushkinaLeg 1

D. Kessler^b
 D. Benjamin
 B. Raschi^d

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Table 1.--Biological data collected by the Alaska and Tracy Anne during the 1992 eastern Bering Sea crab-groundfish survey.

Species	Length measurements	Age structures	Stomach samples
Walleye pollock	34,024	1,288	2,747
Pacific cod	9,464	731 ^{1/}	1,981
Yellowfin sole	23,626	611	848
Rock sole	27,094	535	449
Flathead sole	15,813	420	485
Bering flounder	2,094	--	--
Pacific halibut	1,389	--	329
Alaska plaice	7,581	318	264
Arrowtooth flounder	5,710	97	370
Kamchatka flounder	1,034	165	--
Greenland turbot	440	7	89
Skate	--	--	459
Rex sole	532	--	--
Starry flounder	212	--	--
Pacific herring	265	--	--
Arctic cod	111	--	--
Saffron cod	42	--	--
Pacific ocean perch	109	--	--
Longhead dab	89	--	--
Misc. species	<u>42</u>	<u>--</u>	<u>--</u>
Total	129,671	4,172	8,021

1/ Scale scrape samples, in addition to otoliths, were collected from Pacific cod < 60 cm in fork length. Only otoliths were collected from Pacific cod ≥ 60 cm in fork length and all other species.

Table 2.--Mean catch rates (kg/ha) by depth zone of commercially important fish and crab species taken aboard the Alaska and Tracy Anne in the standard area during the 1992 eastern Bering Sea crab-groundfish survey.

Species	Inner shelf < 50 m	Central shelf 50-100 m	Outer shelf 100-200 m	Total area
Walleye pollock	19.4	75.8	188.7	97.5
Yellowfin sole	112.4	38.7	0.1	43.5
Rock sole	78.5	28.3	4.3	32.3
Pacific cod	12.3	10.4	13.3	11.7
Alaska plaice	10.3	16.0	3.4	10.8
Flathead sole	2.0	13.5	22.8	13.7
Bering flounder	0.0	0.6	0.2	0.3
Arrowtooth flounder	<0.1	3.5	19.7	7.9
Kamchatka flounder	0.0	0.2	3.0	1.0
Pacific halibut	2.8	1.5	2.4	2.1
Opilio Tanner crab	1.7	13.0	11.2	9.9
Bairdi Tanner crab	0.5	5.1	2.4	3.2
Red king crab	1.1	1.5	0.0	0.9
Blue King crab	<0.1	0.7	0.1	0.4
Total effort (hectares)	309.0	728.1	433.3	1,470.3

83-112 EASTERN BOTTOM TRAWL

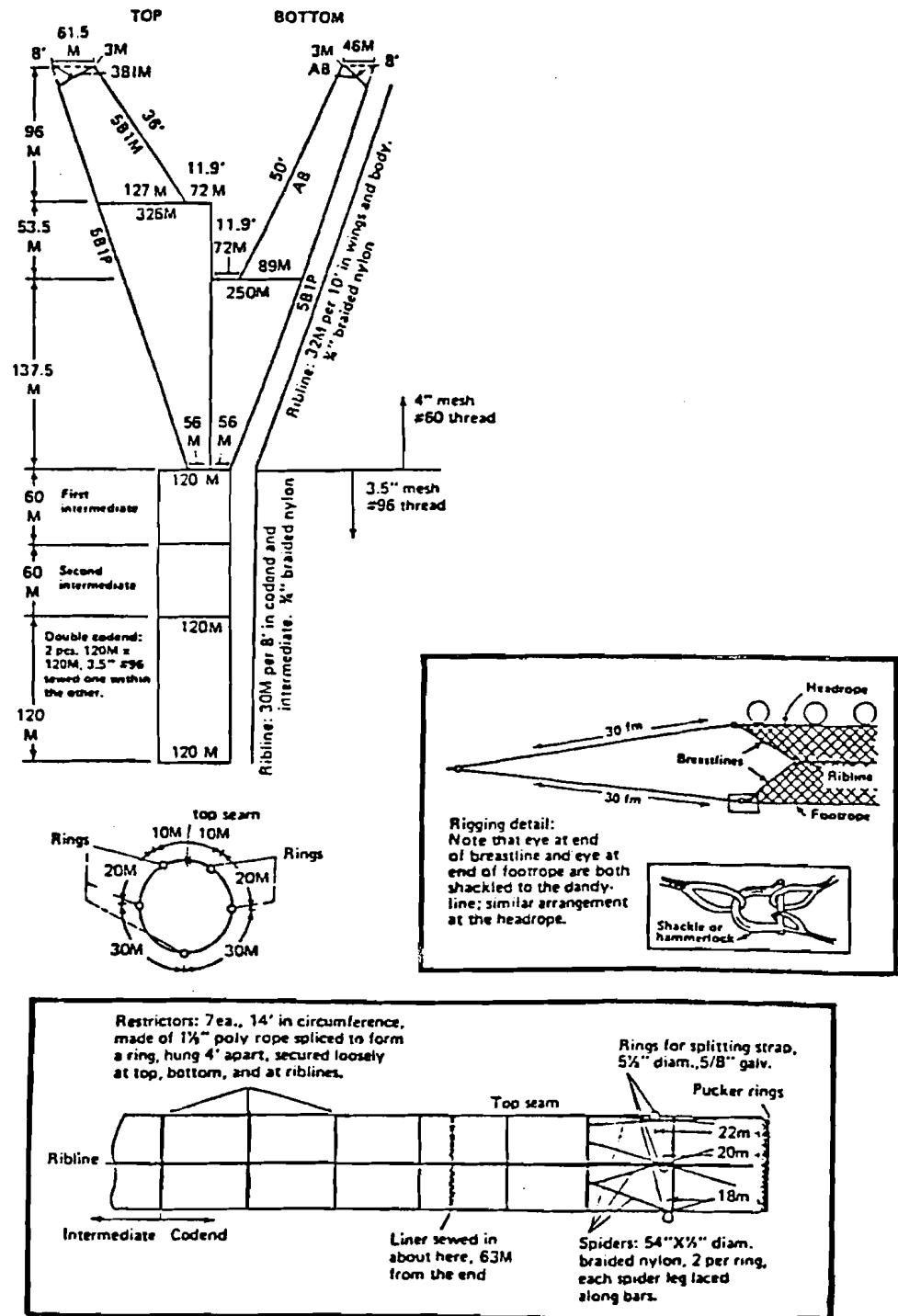


Figure 1.--Diagram of the 83-112 eastern bottom trawl used during the 1992 eastern Bering Sea crab-groundfish survey.

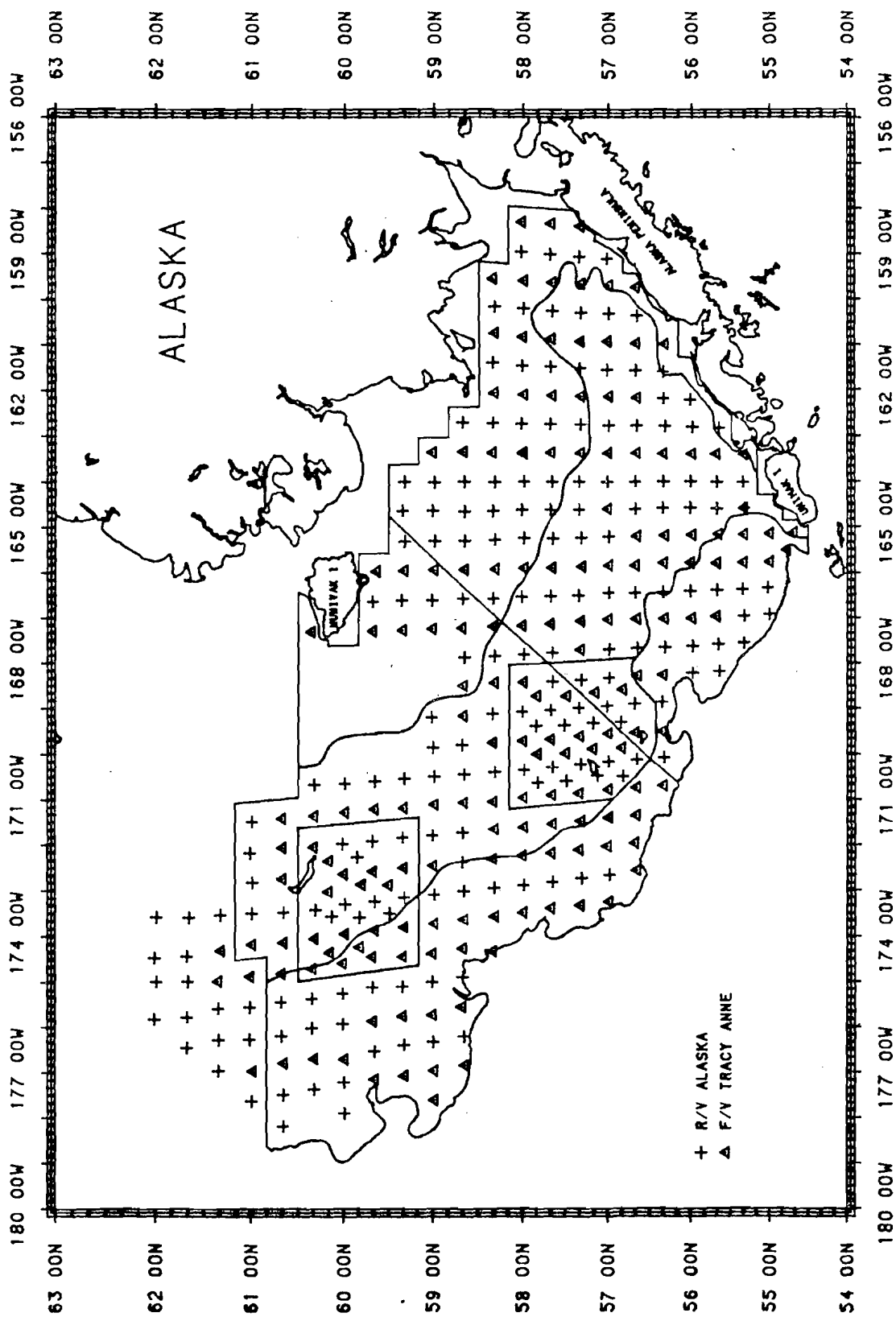


Figure 2.--Distribution of total sampling effort by the Alaska and Tracy Anne during the 1992 eastern Bering Sea survey.

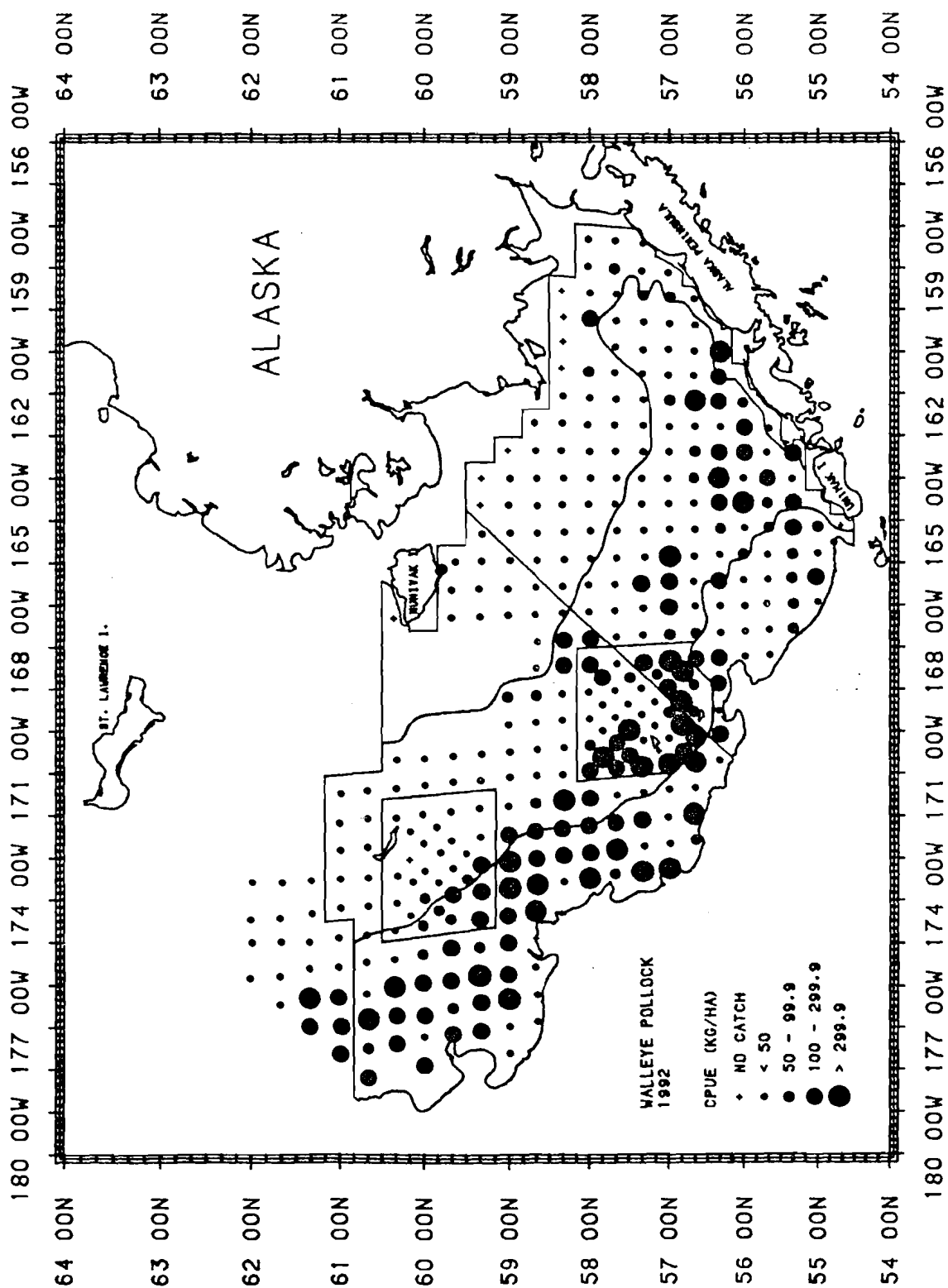


Figure 3.--Distribution of catch rates of walleye pollock from the overall area surveyed by U.S. vessels during the 1992 eastern Bering Sea survey.

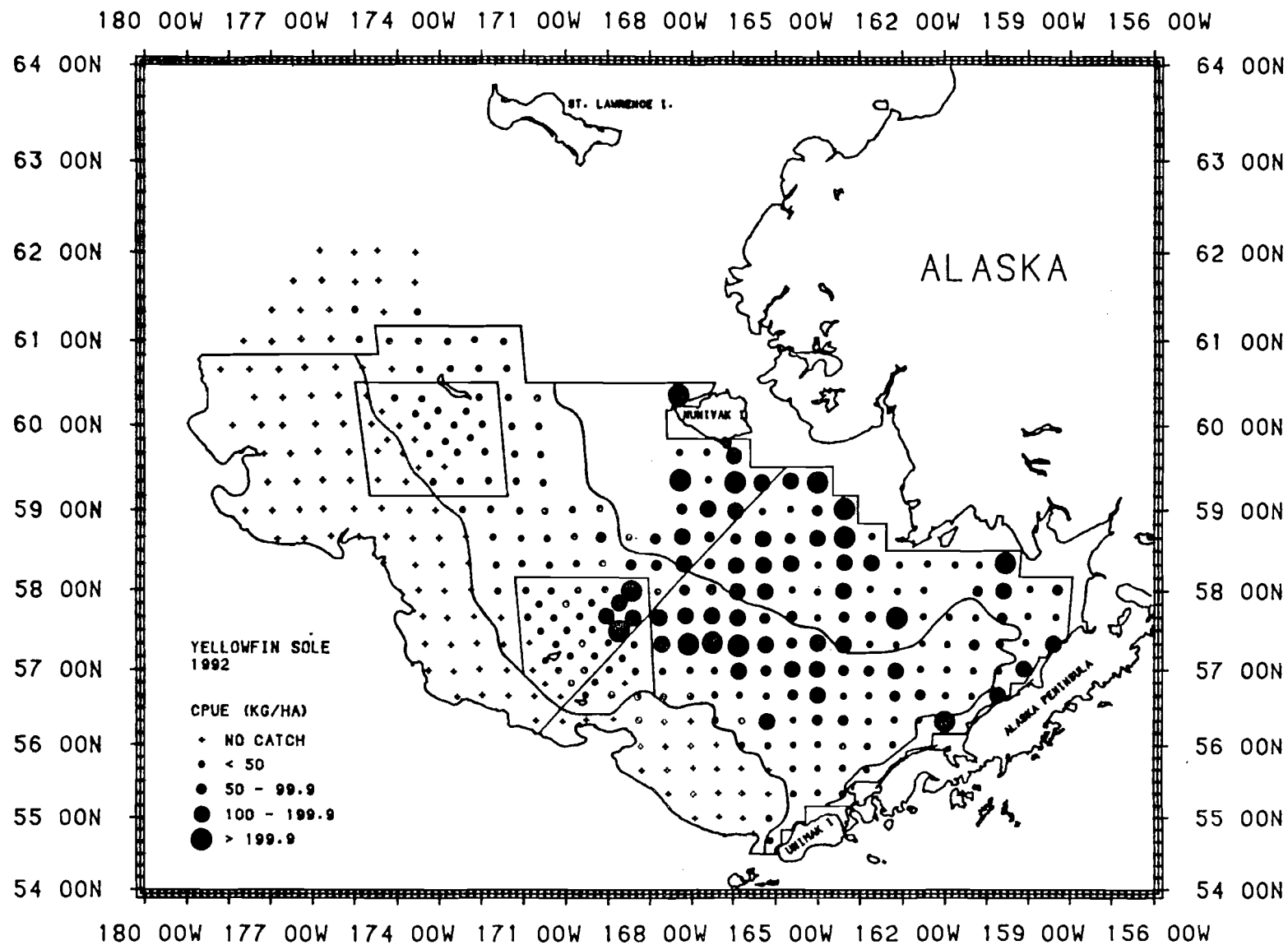


Figure 4.--Distribution of catch rates of yellowfin sole from the overall area surveyed by U.S. vessels during the 1992 eastern Bering Sea survey.

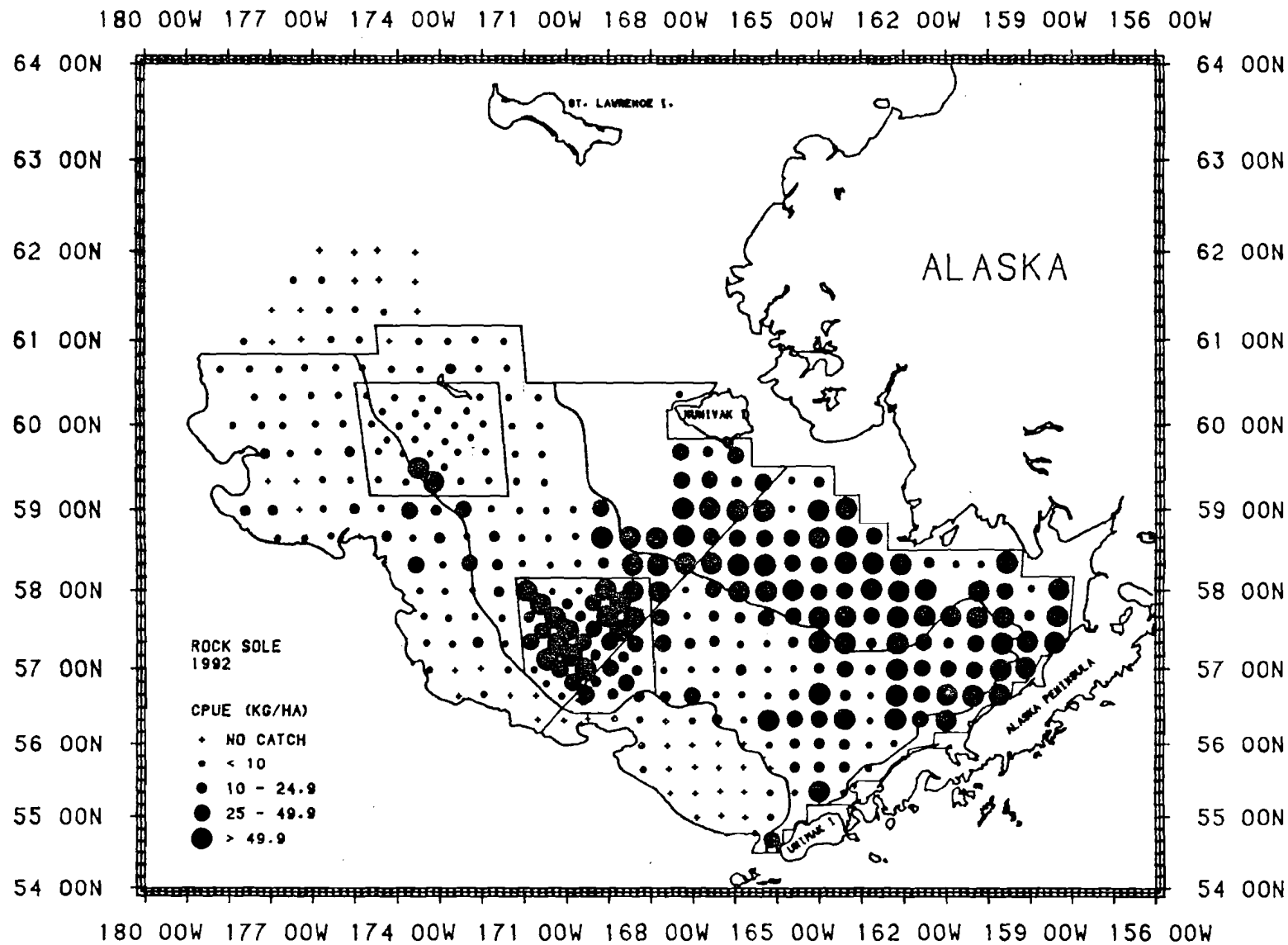


Figure 5.--Distribution of catch rates of rock sole from the overall area surveyed by U.S. vessels during the 1992 eastern Bering Sea survey.

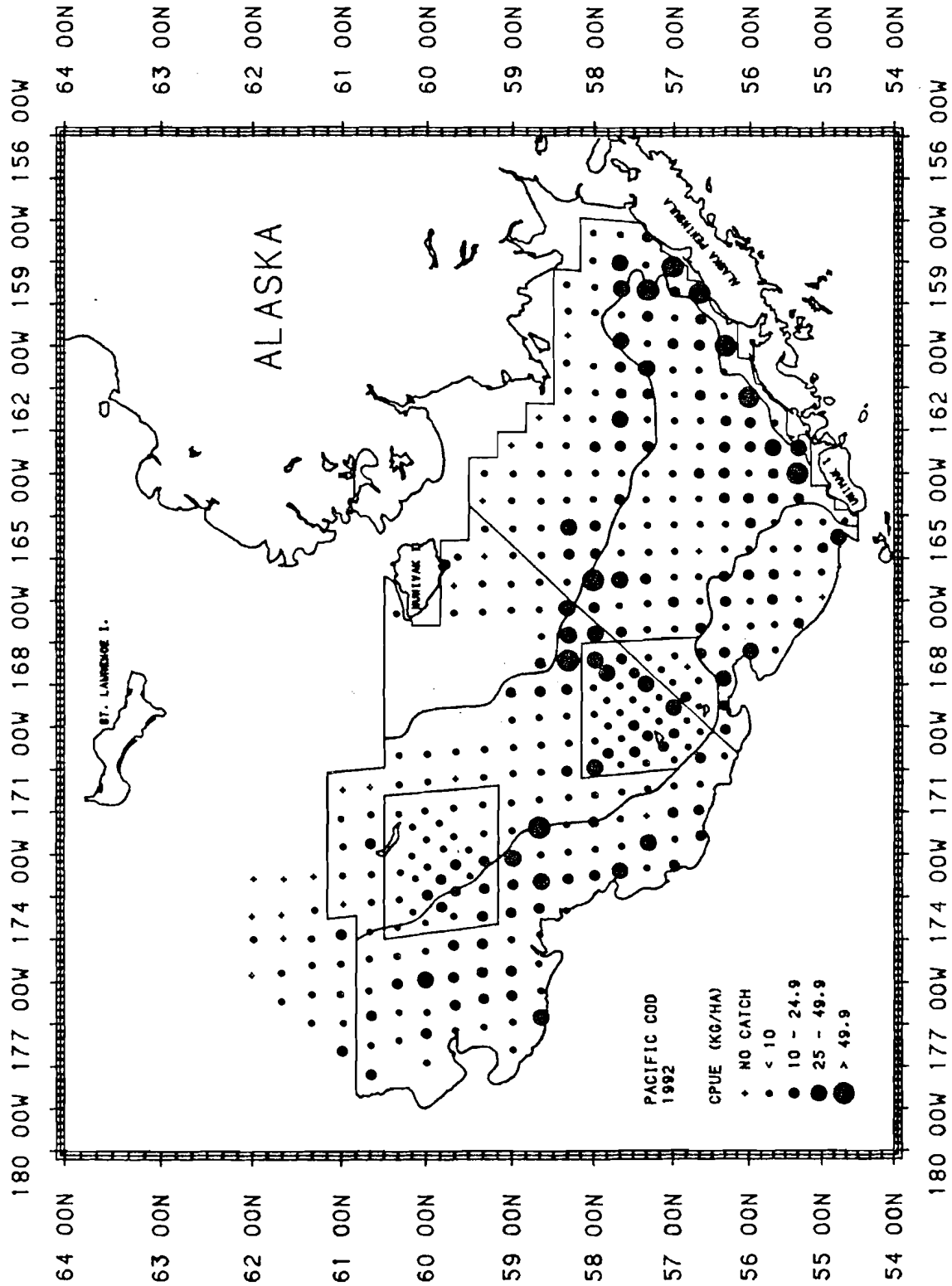


Figure 6.--Distribution of catch rates of Pacific cod from the overall area surveyed by U.S. vessels during the 1992 eastern Bering Sea survey.